Finnra

# The 1999 Research and Development Program of the Finnish National Road Administration

# The 99 R&D

Helsinki 1999

Finnish National
Road Administration

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Johtaja Jukka Isotalo

LIITTEET

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# FOREWORD

Preparation of the 1999 Research and Development Program of the Finnish National Road Administration (Finnra) was begun in spring 1998 and involved a questionnaire sent to the road regions and central administration units, a series of seminars, meetings with the regions' R&D liaison officers, and the key contribution of Finnra's new R&D team. The original aim at the preparatory stage had been to draw up a three-year research program based on a redefined strategy.

On December 7, 1998, Finnra's Management approved the 1999 R&D Program for submission to the Board but was of the opinion that the research strategy should be considered further and that the next R&D program should cover the period of the 2000-2003 operational and financial plan. On December 16, 1998, the Board approved the 1999 R&D Program and a preliminary debate was held on the R&D strategy.

As research co-operation within the EU and between the Nordic countries has increased rapidly and there is more need for information to be available internationally, this R&D Program is also published in English.

Director Aulis Nironen led the R&D team that prepared the program. The other members of the team were Director Jukka Isotalo, Tiina Korte, Jukka Karjalainen from the Savo-Karelia Region, Petteri Portaankorva from the Southeast Finland Region, Erkki Nevala, the Production R&D coordinator, and Anne Leppänen, the Road Administration R&D coordinator.

Helsinki, March 1999

Finnish National Road Administration

## Contents

# 1 FINNRA'S 1999 RESEARCH AND DEVELOPMENT PROGRAM

Since the beginning of 1998, the Finnish National Road Administration has been internally divided into Road Administration (state authority and orderer of works and services) and Production (organization providing road management products and services). The 1999 R&D Program is presented here as a whole, but in practice it is divided into separate programs according to the internal divisions.

The R&D Program takes into account the problem areas specified in Finnra's operational and financial plan, including:

- improvement of the road network in urban areas,
- unsatisfactory condition of the lower-level road network,
- problem-ridden main roads, and
- Traffic safety.

The Road Administration R&D program comprises just two strategic projects: the road structure research program (S4) and solutions to improve main roads (S12). New strategic projects that would tie up future expenditure to a considerable extent could not be included in the program at this stage, as previous commitments leave very little scope for them.

The budget ceiling for the program of the Road Administration is FIM 45 million, which includes some FIM 4 million of retrospective payments from the EU for previous development projects on traffic management and systems for road management. Work commissioned from the Production accounts for some FIM 4.8 million of the total expenditure. Road Administration's own development activities are minor, and so its costs are no longer recorded separately but included in administrative costs. The work done by the Road Administration mainly comprises the commissioning of studies, supervision of the work and disseminating the results to other sections of the organization. The Road Administration's program amounts to 1.1% of Finnra's 1999 budget total (FIM 4,052 million). Consultant costs by unit, including services ordered from the Production, are as follows:

| ROAD ADMINISTRATION 1999 R&D Program | FIM million |
|---|---|
| Strategic projects | 11.0 |
| Strategic Planning | 1.9 |
| Traffic Services | 6.8 |
| Procurement of Works and Services | 0.9 |
| Traffic and Road Engineering | 11.0 |
| Bridge Engineering | 3.4 |
| Traffic and Road Research | 10.0 |
| TOTAL | 45.0 |

The 9 road regions also engage in small-scale research and development related to their own operations, which includes consultant costs of some FIM 4.6 million. Almost half of this is estimated to be purchased from the Production.

The Production has a ceiling of FIM 7 million for external funding for its R&D operations, and its own input is approximately FIM 13.7 million. The Production R&D team draws up the programs for the division's R&D operations. These sums do not include continuous improvement of working practices and products carried out in connection with other work, or any test structures included in contracts separately agreed on with road regions.

The Production's R&D operations focus on developing the core elements of its activities and know-how in terms of road management technology, products and methods of operating. The aim is to prepare for opening up to competition in the future, to enhance competitiveness, to identify products suitable for competitive tendering, and to improve contract management. For this purpose, co-operation with the Road Administration is vital.

**At this stage, development focuses on the following operating areas:**

- winter maintenance
- management of gravel roads
- road structure
- contracting
- improvement of consultant services
- paving methods
- other technologies
- Operating systems.

The overall ceiling for R&D expenditure at Finnra is FIM 70 million, or some 1.7-% of the Finnra budget.

**The ongoing strategic projects are:**

- S4, Road structure research program (continues until 2001)
- S12, Solutions to improve main roads.

The research themes headed by the units and the coordinators responsible for the themes are shown in the table below.

No strategic projects were completed during 1998, but a considerable number of training events were organized in order to disseminate information on the results of the earlier strategic projects Transport and land use (S1) and The socio-economic impact of road management (S11).

## 1999 R&D Program

| Name of strategic project/theme<br>S = strategic project<br>T = research theme | Coordinator | Tel.[1] | Budget 1999 FIM 1 000 |
|---|---|---|---|
| **STRATEGIC PROJECTS** | | | |
| **S Road structure research program (S4)** | A. Valkeisenmäki | 2140 | 8 400 |
| **S Solutions to improve main roads (S12)** | P. Velhonoja | 2315 | 2 600 |
| | | | 11 000 |
| **STRATEGIC PLANNING** | | | |
| T Traffic safety | S. Toivonen/ | 2039 | 1 300 |
| | M. Peljo | 2023 | |
| T Operability of the transport system | U. Priha | 2057 | 600 |
| | | | 1 900 |
| **TRAFFIC SERVICES** | | | |
| T Traffic management* | M. Noukka | 2027 | 4 800 |
| T Customer services | J. Hopeavuori | 2412 | 900 |
| T Traffic control | K. Havu | 2468 | 1 100 |
| | | | 6 800 |
| **PROCUREMENT OF WORKS AND SERVICES** | | | |
| T Development of contracting | A. Huomo | 2670 | 900 |
| | | | 900 |
| **TRAFFIC AND ROAD ENGINEERING** | | | |
| T Impact evaluation | R. Petäjäjärvi | 2175 | 1 100 |
| T Traffic engineering | P. Velhonoja | 2315 | 1 500 |
| T Environment | A. Jansson | 2348 | 1 600 |
| T Maintenance and its impact | A. Leppänen | 2411 | 1 900 |
| T Structures and equipment | K. Lehtonen | 2317 | 2 500 |
| T Pavements | K. Lehtonen | 2317 | 1 300 |
| T Geotechnical structure | P. Salo | 2145 | 1 100 |
| | | | 11 000 |
| **BRIDGE ENGINEERING** | | | |
| T Bridges | M. Kuusivaara | 2349 | 3 400 |
| | | | 3 400 |
| | | | |
| **TRAFFIC AND ROAD RESEARCH** | | | |
| T Traffic and road research information systems | K. Hiltunen | 2530 | 5 100 |
| T Management systems for road management | P. Virtala | 2581 | 2 850 |
| T Traffic safety studies | A. Forsberg | 2534 | 200 |
| T Traffic demand | P. Räty | 2601 | 1 500 |
| T Road network condition surveys | P. Virtala | 2581 | 350 |
| | | | 10 000 |
| **CENTRAL ADMINISTRATION R&D EXPENDITURE, TOTAL** | | | 45 000 |
| **REGIONS** | | | 4 600 |
| **PRODUCTION** | E. Nevala | 2904 | 20 700 |
| **FINNRA'S R&D EXPENDITURE** | | | 70 300 |
| * some FIM 4.0 million of EU financing | | | |

[1] When calling from outside Finnra, the number is preceded by int. + 358 (0) 204 44.

# 2 ROAD STRUCTURE RESEARCH PROGRAM/ RPPGH

## Background

The annual expenditure on construction and maintenance of the paving and geotechnical structure of highways is some FIM 1,500 million. Up to now, the approach to design and choice of structures has focused on construction costs. Significant cost savings can, however, be achieved by developing structural technology and adopting a design approach based on life cycle cost analysis. As the supply of gravel is declining, alternative structural solutions must be developed, for example regarding use of industrial by-products and to exploit the materials available on site more efficiently.

The limited investment in structural road maintenance will, lead to uneconomical structural solutions and premature damage to the road structure in the long term. As yet, there is insufficient knowledge of the mechanisms causing damage to the road structure to control the situation.

The road structure research program was launched in 1994 when the research plan for the Research Project on the Paving and Geotechnical Design of Highways (RPPGH) was completed. Besides the main, extensive RPPGH project, the research program includes several minor projects.

## Aims

| | |
|---|---|
| Cost-effectiveness: | Reduction of life-cycle costs of road structures<br>• for new roads 10%<br>• for roads that are improved 5% |
| Environment: | Less harmful environmental effects by decreased use of gravel and increased use of waste materials |
| Damage: | Investigate the mechanisms causing damage to paved roads and the means to influence them. |

## Content, resources and timetable

**Projects that focus on the aim of cost-effectiveness:**

**RPPGH** **1994-2001**

Research Project on the Paving and Geotechnical Structure of Highways

- life-cycle cost analysis of road structures
- materials development, testing of structures
- description and study of road structure and subsoil characteristics
- identifying research results suitable for road design and construction
- HVS Nordic, Finnish-Swedish collaboration project using a heavy vehicle simulator for accelerated pavement testing

Project coordinator: VTT, the Technical Research Center of Finland

**Coordinator**: Aarno Valkeisenmäki / Production
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**RPPGH/Productization** **1998-2001**

Utilization of research results

- trial use of research results (Production)
- Finnra in-house guidelines and procedures (Road Administration)
- commercial utilization (business sector, VTT, Production)

**Coordinator**: Panu Tolla / Production
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**REFLEX** **1999-2001**

Use of steel meshes to increase load-bearing ability (EU project)

**Coordinator**: Seppo Salmenkaita / Production
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**Production technology** **1997-2001**

Pelletization technology of glacial tills

**Coordinator**: Heikki Suni / Production
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**COURAGE** **1997-1999**

Use of unbound granular materials as bearing courses (EU project)

**Coordinator**: Heikki Suni / Production
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**Environmental geotechnology project** **1995-1999**

- Participation in projects co-financed by the Technology Development Center of Finland (TEKES)
- Test structures (road regions)

**Coordinator**: Aarno Valkeisenmäki / Production
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**Environmental criteria** **1997-1999**

- comparison of environmentally friendly properties of different road structures on the basis of life-cycle cost analysis

**Coordinator**: Aarno Valkeisenmäki / Production
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**Guidelines on use of by-products** **1998-2000**

- compilation of guidance for use of by-products as materials in highway construction

**Coordinator**: Martti Eerola / Production
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**Projects that focus on the basic information aim (damage)**

**Damage analysis** **1999-2001**

- description of damage phenomena in road structures
- basic factors affecting damage to road structures
- how to influence the damage mechanisms

**Coordinator**: Aarno Valkeisenmäki / Production
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**Instrumented test road at Temmes** **1998-2001**

**Coordinator**: Aarno Valkeisenmäki / Production
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**Hamina-Vaalimaa** **1998-2001**

Monitoring and analysis of a road under exceptionally heavy load

**Coordinator**: Panu Tolla / Production
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**Other projects**

**Competition to find most accurate settlement calculation** **1997-2000**

- improved accuracy of settlement calculations
- settlement assessment competition on the Haarajoki test embankment (main road no. 4) (ends in autumn 1999)
- research project of Helsinki University of Technology and Glasgow University

**Coordinator**: Mikko Smura
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**MnRoad collaboration** **1994-2001**

Utilization of results from the Minnesota test road

**Coordinator**: Seppo Salmenkaita / Production
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**Coordinator** of the strategic project: Aarno Valkeisenmäki
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Expenditure in 1999 will be FIM 8.4 million, and in the years 2000-2001 approximately FIM 16.8 million.

# 3 SOLUTIONS TO IMPROVE MAIN ROADS

## Background

With regard to improvement of the main road network, the focus is shifting to improvements to the existing highways. Due to the limited financial resources, it is necessary to develop and test solutions that guarantee adequate standards of safety and traffic flow at reduced cost. The traffic safety standard of the main road network should be improved, especially in terms of serious accidents.

## Aim

Development and testing of new highway types will be continued. The technical standards and guidelines for main two-lane highways will be developed.

## Content, resources and timetable

A plan will be drawn up for new highway type alternatives for 5 pilot roads and the impact and suitability of the solutions will be analyzed.

A survey on standards for junctions on main two-lane highways and on the principles for improvement will be started.

The investigation into the safety of grade-separated junctions on the main road network will be completed. A review of guidelines will be started.

The report on experience concerning arrangements where private roads have limited access to main roads will be completed. The principles concerning combined arrangements for private roads and pedestrian and cycle routes will be developed.

Solutions will be developed for improving safety in loss-of-control situations (rock cuttings, roadside ditches, crash barriers).

An investigation will be started with a view to developing the procedures for conducting safety audits on main highways.

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Pilot roads | P. Pesu | Dec 2000 |
| Main road junction standards | M. Vehviläinen | |
| Traffic service level | P. Velhonoja | Jne 2000 |
| Safety of road margins | K. Lehtonen | Dec 2000 |
| Arrangements for private roads | A. Liimatainen | Dec 1999 |
| Safety audits of main roads | NN | |

Total expenditure on the research theme in 1999 will be FIM 2.6 million, and for the years 2000-2001 a total of FIM 6 million.

**Coordinator** of the research theme:
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# 4 TRAFFIC SAFETY

## Background

The Government Resolution of August 28, 1997 on improvement of traffic safety lays down as objectives a continued falling trend in the most serious personal injuries up to 2005 at the same rate as in the 1990s and attaining a safety standard closer to that of Sweden and Norway. This would mean that the annual rate of traffic fatalities would be less than 250 in 2005. The Government Resolution is related to the 1997-2005 Road Safety Program issued by the Traffic Safety Advisory Board. The actions assigned to Finnra in the Program also call for research and development.

Finnra's Traffic Safety 2005 strategy and the traffic safety program being prepared lay out guidelines for future action and respond to the challenges posed by the Government Resolution and the Road Safety Program. These challenges are included in the objectives laid down for Finnra in its operational and financial plan. The Road Safety Program specifies the requirements for research and development, which will be of decisive importance for the attainment of the traffic safety objectives, especially in terms of serious accidents on main highways and in built-up areas.

## Aim

The aim of the research theme is to ensure traffic safety information is kept up to date (concerning the current situation and future developments), to highlight the problems and need for improvement, to promote introduction of measures and procedures that improve traffic safety, and to enhance knowledge about traffic safety. At the same time, the research should promote attainment of the traffic safety improvement objectives set for Finnra and also traffic safety work in general.

The more specific objectives for 1999 include:

- Promoting regional traffic safety planning and integrating it with transport planning
- Improving traffic safety impact assessment of road management measures
- Participation in prevention of the most serious road accidents in accordance with the Ministry of Transport and Communications' traffic safety research program.

## Content, resources and timetable

In accordance with Finnra's traffic safety strategy and program, the focus areas for research and development under this theme are:

1. Safety of the transport system
2. Traffic safety objectives
3. Safety standard of public roads

4. Prevention of the most serious accidents

5. Participation of private citizens and road management quality control

6. Knowledge of traffic safety

The need for research and development efforts related to the focus areas listed above is continuous. The budget ceiling for external funding in 1999 is FIM 1.3 million. In addition, R&D work that has a bearing on traffic safety is also carried out in connection with other research themes and projects.

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# 5 OPERABILITY OF THE TRANSPORT SYSTEM

## Background

A broad range of development programs, research studies and other efforts are directed at urban areas with a view to developing community structure and the functions within it, including the transport system, on a more sustainable basis. Considerable development input will be needed regarding the approach and methods of road management service provision to enable Finnra to participate productively in this collaboration.

## Aim

This research theme focuses on the main development principles related to the functioning of the transport system in society. The focus of the work is to integrate urban policy and design solutions as part of Finnra's established practice, through developing transport system planning and the various collaboration projects between ministries and central administrations under the LYYLI program for the development of an environmentally sound community structure and transport system.

## Content, resources and timetable

Finnra's policies on urban areas will be developed in conjunction with the road regions. The regions' projects in urban areas will be analyzed, and experiences of transport system planning processes so far will be collected and assessed. The development encompasses public consultation in transport system planning, as well as practical solutions for integrating transport planning and land use planning and for managing transport demand and mobility. The Ministry of Transport and Communications is developing operating models to improve stakeholder collaboration in implementing transport system plans.

Within the LYYLI program, Finnra is participating in three project areas by providing financing: integration of ring roads in the urban structure, assessment of the indirect impacts of transport system projects (Välikäsi), and the HHT project investigating the transport system in the Helsinki-Hämeenlinna-Tampere zone and its effects on people, fauna and urban structure. With regard to other LYYLI projects, Finnra participates in the monitoring groups. Through LYYLI, Finnra also participates in developing other research programs on urban areas.

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Development of transport planning | Ulla Priha | continuous |
| LYYLI program | Ulla Priha | 1997 - 2001 |

**Coordinator** Ulla Priha
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Total expenditure on the research theme in 1999 will be FIM 0.6 million, and for the years 2000-2001 an estimated FIM 2.2 million.

# 6 TRAFFIC MANAGEMENT

## Aim

Development of Finnish traffic management concepts and transport telematics, their controlled introduction, and creation of uniform principles for use and operation. The research theme supports the following target areas for the operational and financial plan period: traffic safety, traffic flow, cost-effective road management and transport system operability (new operating approaches for urban areas, problem-ridden main roads).

## Background

The research theme continues the work done in the traffic management project in 1993-1996, and in connection with road transport telematics experiments on the trial section of the E18 road in 1996-1998, and also under the traffic management research theme in 1997 and 1998. Deployment of telematics in traffic management is an area of road management where rapid advances will be made in the coming years.

The research theme is based on the following:

- Finnra's traffic management strategy (approved by Finnra's Board on December 18, 1997)
- The three-year (1998-2000) TETRA research and development program of the Ministry of Transport and Communications, on the structure of transport telematics
- Joint decisions by the EU Member States about the implementation of services that make use of transport telematics in Europe:
- Community strategy and framework for the deployment of road transport telematics in Europe (1997)
- Memorandum of Understanding on the implementation of RDS-TMC traffic information services and information exchange between traffic information centers in Europe (1997)
- 1996-1999 VIKING program, which is implemented in association with the transport authorities of Sweden, Denmark, Norway and northern Germany. The VIKING program receives support from the EU's TEN-T (Trans-European Networks - Transport) budget.

## Content and resources

The budget for the theme in 1999 is FIM 4.8 million. In addition, more than 100 person works months of the Road Administration division's personnel resources are allocated to the research theme. The projects under the theme are financed partly from Finnra's appropriations and partly by EU support. The EU support is paid retroactively. In 1999, Finnra expects to receive FIM 2.5-3.0 million from the EU, comprising support for projects implemented in 1997-1998 and possibly for the 1999 projects.

The theme is divided into six project areas:

1. Monitoring of traffic and road conditions
2. Traffic information centers, information systems and information exchange
3. Traffic control / Traffic management methods
4. Traffic information services
5. Demand management
6. Project management

The details of the research theme are shown below by project area.

Monitoring of traffic and road conditions provides the basis for traffic management. The aim is to develop methods for collecting and processing information obtained from point sources and along road sections on local weather conditions, traffic and travel times. A further aim is to ensure clear and consistent transport architecture for roadside equipment and for information retrieval and transmission.

The project area dealing with traffic information centers, information systems and information exchange will focus on developing the operation of the network of traffic information centers together with the other actors concerned (e.g. cities, the police, rescue authorities). The primary aim is to introduce phased implementation of an information system to support the operations of the traffic information centers.

The traffic control / traffic management methods project area will focus on investigating the effects of the variable traffic control systems that have been introduced (in the first instance, variable speed limits).

The traffic information services project area seeks to revise Finnra's policy concerning the provision of traffic information. As a new policy area, the project area will look into the principles for transmitting information from Finnra to external service providers. With regard to service development, the project area will focus on evaluation and expansion of the RDS-TMC traffic information system and use of the Internet for providing information to road users. These projects will also evaluate the performance of the Road Weather Service in the winter season 1998-1999.

In the area of demand management, participation in Nordic collaboration projects will be continued, involving monitoring of the advances in user fee collection systems and engagement in small-scale development (MÅNS), and reports will be drawn up on experiences from EU projects on the methods and applications of demand management.

Project management mainly comprises coordination of the VIKING program at the international and national level, i.e. preparation of and participation in meetings of the Project Management Board, preparation of applications for EU funding, organization (?) of the Finnish VIKING seminars, and coordination of the Finnish VIKING program.

**Coordinator** responsible for the research theme:
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# 7 CUSTOMER SERVICE

## Background

Customer orientation plays a key role in Finnra's values and its new vision of road administration. This research theme promotes development of the Road Administration division's customer services and develops its approach to customer service in general. In addition, this theme produces tools that serve to support the role of Road Administration as an expert authority, in accordance with the vision. This research theme will also produce information relevant to other problem areas, namely the role of the lower-level road network in the transport system, the optimal standard of maintenance to be applied to these roads, and the cost-effectiveness of road management.

## Aim

To develop approaches and tools to support customer-oriented operation.

## Content, resources and timetable

This theme comprises the following sub-projects: the customer orientation project, updating of the ERIKU system (a system that assists in routing oversized and/or heavy loads), changeover to a map-based system in handling of customer feedback, and a survey of the current roadside services and issuing of new in-house guidelines concerning them.

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Customer orientation project | Olli Kataja | 1998 - 1999 |
| Further measures related to the customer orientation project | Olli Kataja | 2000 |
| Updating of the ERIKU system | Seppo Terävä | ? |
| Map-based handling of customer feedback | Jukka Hopeavuori | ? |
| Development of roadside services | Teuvo Kela | ? |

Total expenditure on the research theme in 1999 will be FIM 900,000, and the financing needs for the years 2000 - 2001 is estimated at FIM 3,900,000.

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# 8 TRAFFIC CONTROL

## Background

The aim is to participate actively in research and development activities, including international research programs, so as to produce new information on Finnra's key operating areas. The projects under the research theme pay particular attention to traffic safety, cost-effective road management and customer orientation. Systematic implementation of the projects, which address, for example, a traffic sign management system or life-cycle analysis of road markings, will provide answers relevant to the problem areas presented in the R&D strategy.

## Aim

**Road signs**: a preliminary study and a project plan for the implementation of a management system will be completed in 1999. The system will be completed in 2001 and ready for introduction during 2002. This project is also supported by on-going joint Nordic research projects, such as testing of coatings used in traffic signs and surveys of the quality of Finnish-made signs.

**Principles of route signing systems**: the development work (a survey and a policy proposal) is planned for 2000-2001.

**Road markings**: the program of experiments with profiled road edge and centerline markings will be expanded in 1999, and the life-cycle analysis of road markings and Nordic collaboration in testing the operational characteristics of various types of road markings in rainy and damp conditions will be continued. Guidelines on use of profiled road markings will be issued in 2001. The road markings management system will be developed with the aid of life-cycle analysis information to include 'optimization models' for cost-effective choice of materials for road markings.

**COST 331 quality requirements for road markings + CEN standards**: As the COST project will be completed in 1999, an interim and final report will be drawn up and a PC application concerning choice of properties for road markings will be released. The results will be analyzed and presented in a Finnra publication. Development of CEN standards requires both laboratory and field tests. Finnra will participate in the preparation of the relevant programmers in 1999. In 2000 - 2001, Finnra will participate in the development work together with the other Nordic countries to ensure that the specific requirements related to Finnish conditions (winter conditions, studded tires, etc.) are taken into account.

**Traffic at road works and road construction sites**: Preparation for and drawing up of new guidelines will be started in 1999. In 2002, Finnra's new guidelines for road works and road construction sites will be introduced to support the new practices concerning procurement and contracting of services.

## Content, resources and timetable

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Traffic sign management system | Mikko Karhunen | 1999-2001 |
| Testing of traffic signs/road markings; Nordic projects | Per-Olof Linsen | 1999-2001 |
| Impact of road markings on traffic safety | Kullervo Havu | 1999-2001 |
| Life-cycle analysis of road markings | Kullervo Havu | 1999-2001 |
| Traffic at road works and road construction sites | Esko Tuhola | 1999-2001 |
| COST 331 | Kullervo Havu | 1999 |
| CEN methods | Kullervo Havu | 1999-2001 |

Total expenditure on the research theme in 1999 will be FIM 1.1 million, and the need for financing in 2000-2001 will be approximately FIM 1.2 million per year.

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# 9 DEVELOPING THE PROCUREMENT OF SERVICES

## Background

Development of service procurement has been defined as one of the Road Administration division's three key tasks. The research theme aims to prepare for opening up to competition and operation on the open market and for management of new forms of contracting to be introduced in Finnra.

Improving the profitability of procurement is a continuous process within Finnra, and the process, methods and tools must be developed to ensure that results are attained.

## Aim

The aim of the research theme as a whole is to develop the management of service procurement for road management. The focus areas and sub-projects under the theme change year by year. Implementation of the theme is designed with a view to opening up to competition. In 1999, the theme will focus on the following areas:

1. Start of development work on a unit cost register for road management services, including related preliminary studies.
2. Implementation and nationwide introduction of an inventory system for equipment and supplies for road network maintenance.
3. Further development of the procurement management system to serve procurement of road management services and the related financial administration.
4. Taking into account the needs arising from international contracting in the context of design and quality requirements and in-house guidelines and procedures.
5. Review of instructions on content and presentation of road plans.

## Content, resources and timetable

| Sub-project | Coordinator | Project timetable |
|---|---|---|
| Development of a unit-cost register | | 1999-2000 |
| Development of an inventory system for equipment and supplies | | 1999-2000 |
| Development of procurement management system, phase 2 | Ari Huomo | 1999 |
| Requirements of international contracting | | 1998-1999 |
| Review of instructions on content and presentation of road plans | Matti Hämäläinen | 1998-1999 |

Total expenditure on the research theme in 1999 will be FIM 900,000. Total costs for 2000-2001 is estimated at FIM 3 million.

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# 10 IMPACT EVALUATION

## Background

Procedures applied to assess the impact of traffic and road management need to be continuously improved in order to ensure that they are feasible, suitable for the purpose and up to date. In 1998, the matter was discussed in the report of the Ministry of Transport and Communications' working group on project evaluation and in the State Audit Office auditors' report entitled 'Development of the road network'. One of Finnra's result targets in 1999 is to develop the evaluation of project profitability.

## Aim

The aim is to create impact evaluation procedures that are as uniform as possible for application at both project and program level. Updating of the IVAR application software for socio-economic evaluation will be started. The evaluation model used for development projects will be revised and the role of environmental aspects in evaluation will be strengthened. A model will be created for evaluating the profitability of minor road and road management projects.

## Content, resources and timetable

The research theme focuses on developing evaluation tools. Updating the IVAR software requires considerable input. The theme also includes development of impact evaluation at program level, which previously formed part of another research theme, and development of environmental impact and community impact evaluation, which previously formed part of an environmental theme.

The basic data for calculation of driving costs is being updated. The socio-economic evaluation of major development projects will be reviewed to develop project evaluation in general. New in-house guidelines for project evaluation will be issued. Procedures for evaluating profitability will be developed.

The guidelines for assessing the environmental impacts of small-scale projects and for assessing impacts on people and communities will be completed at the beginning of 1999. Strategic environmental assessment will be developed in connection with operational and financial plans and long-term plans.

Training focuses on applying the new driving cost manual, project evaluation in terms of socioeconomic effects and profitability and the guidelines on environmental impact assessment.

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Strategic environmental assessment | Mervi Karhula | 1999-2000 |
| Project evaluation | Reima Petäjäjärvi | continuous |
| IVAR software | Reima Petäjäjärvi | 1999-2001 |

Total expenditure on the research theme in 1999 will be FIM 1.1 million, and for the years 2000-2001 an estimated FIM 3.8 million.

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# 11 TRAFFIC ENGINEERING

## Background

The traffic engineering standards and guidelines for roads need to be continuously maintained and improved. This is necessary because of vehicle changes, legislative amendments, new emphases in road management, new research findings, customer feedback and experiences, etc. Key areas of focus in the standards and guidelines are traffic safety, improvement of safety skills and revising the guidelines in the light of new procurement methods.

## Aim

The aim is to continue revising and improving the guidelines and methods, particularly for at-grade junctions. The operating conditions for bus and public transport will be improved, and safety awareness and auditing further developed.

## Content, resources and timetable

New design guidelines for at-grade junctions will be completed during 1999, and a report on the functioning of roundabouts will be finalized.

Field measurements to serve the revision of junction capacity models will be carried out, and a basic structure for the model will be proposed.

Draft instructions for road-tunnel design have already been completed.

Safety information will be compiled and published to improve safety awareness.

Development of a safety-audit procedure will be organized and initiated.

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| At-grade junctions, roundabouts, guidelines, studies | J. Saarelainen<br>A. Liimatainen | June 1999 |
| Junction capacity | | April 2000 |
| Road tunnels | P. Velhonoja | Dec. 1999 |
| Designers' safety awareness | A. Liimatainen | Dec. 2000 |
| Safety-audit procedure | | 2001 |

Total expenditure on the research theme for 1999 will be FIM 1.5 million, and for the years 2000 - 2001, and FIM 3 million (estimate).

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# 12 ENVIRONMENT

## Background

Environmental research and development must anticipate environmental challenges. Finnra's capacity to meet these challenges will be secured through improving its expertise in these areas. The Finnra environmental action program focuses on guidance and training, although the decrease in available personnel resources and appropriations has meant that there is less capacity for research (i.e. for acquiring the knowledge needed for planning and development). A remedy for this imbalance must be found as soon as possible.

## Aim

Developing Finnra's environmental expertise will be continued under the research theme by issuing instructions and guidelines, evaluating the state of the environment and the management of environmental impacts, and by developing environmentally sound solutions and the management of environmental issues in various processes. The main emphasis will remain on drawing up instructions and guidelines supported by site investigations and pilot projects in conjunction with the road regions.

## Content, resources and timetable

A landscaping maintenance guideline and the continuation of the program on protection of roadside nature will be completed during 1999. The revision of the guideline on major urban thoroughfares will be started, but the main emphasis in 1999 will be on developing cost-effective and safe environmental solutions for roads in built-up areas. Monitoring work will cover experiments with wild-growing plants and the section of main road no. 7 between Koskenkylä and Loviisa. The efforts to develop methods for controlling animal movements will be postponed, as will finalization of the monitoring of main road no. 1 between Paimio and Muurla. Studies will be made of the effect of bypasses on built-up areas, the development of scenic routes and noise-source data (for the Nord 2000 model).

The environmental monitoring systems used by road regions and the environmental indicators of the Road Administration will be improved. Environmental considerations in procurement of road management services will also be given more attention. The study being undertaken of the expectations and changes concerning Finnra's operating environment is also linked to Finnra's 200th anniversary.

In the area of training, the main issues are the reform of the Building Act and landscaping design, construction and maintenance. The results of the third national road competition will be announced on May 26, 1999, and the biannual landscaping conference will be held on September 13-15 in Lapland.

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Instructions, guidelines | A. Jansson | continuous |
| Status reports, monitoring | R. Merivirta | continuous |
| Environmental solutions | R. Merivirta | continuous |
| Management of environmental issues | M. Karhula | continuous |
| Finnra's operating environment | N. Halla | continuous |

Total expenditure on the research theme in 1999 will be FIM 1.6 million and in the years 2000 - 2001, FIM 5 million (estimate).

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# 13 MAINTENANCE AND ITS IMPACT

## Background

Today, maintenance is an essential part of road management. Proper impact assessments on maintenance must be included in road management planning. Only a few research institutions and universities conduct R&D in the area of road maintenance, and there are very few consultants with expertise in this field. Traditionally, the leading expert on maintenance has been Finnra, as is the case with equivalent authorities abroad. Following Finnra's internal division into Road Administration and Production, less attention has been paid to R&D on maintenance, despite the fact that maintenance has become increasingly important as the resources for road network development have decreased.

## Aim

The aim over the next three years is to increase research on maintenance and to train new researchers and consultants. The relationship between the quality and impact of maintenance and also between quality and cost will be studied. In addition, quality requirements, quality assurance and cost management will be developed for the purposes of service procurement, and management of weather conditions will be improved (creation of a more accurate weather index). Technical advances in the field of maintenance will also be followed.

## Content, resources and timetable

Sub-projects initiated or continuing in 1999. Funds permitting, the projects at the bottom of the list will be started during the year.

| Maintenance and its impact/ Sub-project | Coordinator | Project timetable |
|---|---|---|
| Impact of winter maintenance on main coastal roads, in cooperation with the Turku road region/Production/central administration | R. Hörkkö/Turku<br>R. Kuusela/Prod.<br>A. Leppänen | 1998 - 2000 |
| Impact of maintenance on the lower-level road network; Quality, central Adm. and Savo-Karelia road region | A. Leppänen<br>J. Karjalainen | 1998 - 1999 |
| Improving the weather index | O. Penttinen<br>H. Lappalainen | 1998 - 1999 |
| The environment and new types of salt | O. Penttinen | 1998 - 2000 |
| Improvement of maintenance and management with local auth, coop. central Adm. / Oulu road region /local auth. in Oulu region | A. Leppänen<br>O. Penttinen | 1999 |
| Winter maintenance handbook | H. Lappalainen | 1999 - 2000 |
| Pedestrian and cycle accidents and the maintenance standard of routes | A. Leppänen<br>H. Lappalainen | 1999 - 2000 |
| Maintenance as a part of the OFP program's impact | O. Penttinen<br>A. Leppänen | 1999 |
| Customer profile and customer needs in night-time traffic | A. Leppänen | |

Total expenditure on the research theme in 1999 will be approximately FIM 1.9 million, and in the years 2000-2001, FIM 2-2.2 million (estimate).

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# 14 STRUCTURES AND EQUIPMENT

## Background

The objective is to transform instructions and quality requirements into a format

- which allows the design of structures and equipment to be left to the contractor , when necessary, and
- which takes the Act on public procurement and EN standards into account.

Developing of performance requirements instead of old descriptive ones will require considerable research and extensive changes to guidelines. The development of manufactured products and production methods will largely be transferred to manufacturers and contractors. Product development will be promoted with clear performance requirements and trials, and, in special cases, with financial support (30%, for instance when patenting is not feasible, etc.).

The content of EN standards will be supervised and influenced by Finnra in a coordinated manner.

## Aim

**Road structure**: Material parameters and structural durability comparisons will be completed in 1999 and the drafting of dimensioning guidelines will begin. The first version of the guidelines should be ready in the year 2000. In addition, standard specifications for bound and unbound layers) and possibly for handling of rock will be updated. The use of cheaper pedestrian and bicycle road types will be examined.

**Drainage**: The standard specification for pipes will probably be revised in the year 2000.

**Groundwater protection**: Instructions on the need for protection of ground water and standard specifications for protective structures will be completed in 1999.

**Lighting**: Instructions and standard specifications (including maintenance) will be updated.

**Safety fences and roadside safety**: In 1998-2001 this will be covered under the strategic project for improving main two-lane highways.

**Fences**: Instructions were completed in 1998, standard specifications will be completed in 1999.

**Noise barriers**: Instructions were completed in 1998.

**Equipment foundations**: Dimensioning instructions will be implemented in 1999.

## Content, resources and timetable

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Instructions for structural design | Kari Lehtonen | 1996 - 2000 |
| Standard specifications for unbound and cement bound layers | Tuomo Kallionpää | 1998 - 1999 |
| Groundwater protection | Kari Lehtonen | 1997 - 1999 |
| Noise barriers | Kari Lehtonen | 1997 - 1998 |
| Road lighting | Kari Lehtonen | 1999 |
| EU and EN standardization | Osmo Anttila | continuous |
| Technical quality requirements for new kind of projects | Kari Lehtonen | 1998 - 1999 |

**Resources** for the research theme:

- Labor input: three person work years
- Commissions from Production and outside in 1998-2001: FIM 2.4-3.5 million per year (1999: approx. FIM 2.4 million, which is equal to 6 person work years), of which 50 per cent will be allocated to road structure.

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# 15 PAVING

## Background

The objective is to transform guidelines and quality requirements into a format

- which favors product development by contractors and manufacturers, and
- takes EN standards into account.

This means that the impact of different factors on the durability of pavements will be examined thoroughly, which will require extensive research. The development of manufactured products and production methods will largely be transferred to manufacturers and contractors. Product development will be promoted with clear performance requirements and trials, and, in special cases, with financial support (30%, for instance when patenting is not feasible, etc.).

The effects of draft EN standards will be examined and efforts made to contribute towards their development.

## Aim

**Durability models**: A preliminary study on the impact of aggregates on abrasion resistance was conducted in 1998. The model will be improved and other factors considered during 1999-2002. A trial set of guidelines will be drawn up in 1999. Modeling of deformation and trials on preventive methods were begun in 1998.

Thickness dimensioning comes under the section entitled Structures and Equipment.

**Instructions and standard specifications**: Guidelines were completed in 1998. The standard specifications will be revised in autumn 1999.

**Research methods**: The application of EN standard methods (Microdeval in 1999, for example) will be examined and methods for assessing completed pavements will be developed.

**Environmental issues**: Watertight pavements will be developed with manufacturers in 1998-1999, and pavements required for noise abatement may then be developed in 1999 or 2000. Risks in heat-treatment of old pavements, and the alternatives, will also be studied.

**Product development support**: Continuous participation in the improvement of stabilization methods. In 2000, methods will be sought with which the manufacturers could demonstrate the performance of their own pavement types. Finnra will participate in studies of the industry to develop the use of by-products.

The possibility of starting a TEKES-sponsored research program for the years 2000 - 2005 will be examined.

## Content, resources and timetable

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Durability models | Kari Lehtonen | 1997 - 2002 |
| Instructions | Katri Eskola | Continuous |
| Research methods | Mats Reihe | Continuous |
| Environmental issues | Mats Reihe | 1997 - 2001 |
| Product development support | Mats Reihe | continuous |

**Resources** for the research theme:

- Labor input: three person-work years
- Commissions from Production and outside in 1998 - 2001: FIM 1.2-1.8 million per year (1999: approx. FIM 1.2 million, equal to 3 person work years).

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# 16 GEOTECHNICAL STRUCTURE

## Background

Ground improvement accounts for a substantial proportion of the costs of several future development projects. Developing ground improvement methods can reduce construction and maintenance costs. Because of new procurement methods, revisions to guidelines and procedures will be necessary, which will require additional research. Development of geotechnical structures will be possible under this research theme because only limited research is possible under RPPGH.

## Aim

The aim is to reduce the cost of constructing on weak ground and to develop environmentally friendly and sound solutions. Special attention will be given to developing solutions that retain the e.g. in cross-section of the road. Results will be utilized by developing the quality requirements and design guidelines for road construction. In concrete terms this will lead to lower costs and better roads. The results of each project will reported and also publicized at training sessions. If necessary, seminars will be organized.

## Content, resources and timetable

| Theme / Sub-project | Coordinator | Project timetable |
|---|---|---|
| Geotextiles used as separation function and reinforcement function<br>- developing the classification criteria of non-woven geotextiles (separation and filtration function)<br>- test embankments of geotextiles (reinforcement function)<br>- widening roads on weak ground (start depends on funding) | Pentti Salo | 1997-2000 |
| Lime/cement columns<br>- grater column spacing<br>- Test-embankment reports<br>- Interaction between lime/cement column and soil | Pentti Salo<br>Mikko Smura | 1999-2000 |
| Developing design principles and quality requirements<br>- Design principles for road geotechnics<br>- General quality requirements for road constructions and specifications | Pentti Salo | 1999-2000 |

External costs will come to approx. FIM 0.8 million, and commissions from Production will come to approx. FIM 0.3 million. In 1999, the total expenditure on the research theme will be FIM 1.1 million and some FIM 2.3 million in 2000-2001.

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# 17 BRIDGES

## Background

The following deficiencies can be noted at present:

The maintenance of bridges has been somewhat neglected; their condition is not monitored systematically and is often done without proper expertise; determining the extent and correct timing of renovation is often incomplete; the life-cycle approach is only being introduced to bridge maintenance and lacks research-based background information; and the procedures and quality assurance pertaining to new procurement methods are incomplete.

In 1998, Finnra's management approved the strategies proposed in a report on bridge maintenance, upkeep and repair and adopted them as Finnra's operating principles. The preconditions for practical implementation of the operating principles will be created during the R&D program period. Capacity to apply "full responsibility contracting" methods in bridge construction will also be provided through development activities.

## Aim

For the entire program period, the aims are:

1. to achieve optimal useful life of bridges by improving maintenance and repair. This aim supports the implementation of the aforementioned strategies at Finnra;

2. to create the necessary ability for "full responsibility contracting" procurement of bridges and the required procedures.

The future European design, product and test standards will be given their final form during the program period. Finnra will seek to influence these standards on the basis of Finland's standpoint and background reports.

The aims for 1999 also apply to the entire program period.

## Content, resources and timetable

| Sub-theme/Project | Coordinator | Project timetable |
|---|---|---|
| **1. Optimal bridge maintenance** | | |
| Improving bridge inspection | Kari Moijanen | March 1, 1998 - Dec. 31, 1999 |
| Follow-up inspections of bridges | Jouko Lämsä | 1999 - 2001 |
| Bridge repair instructions (SILKO) | Jouko Lämsä | 1999 - 2001 |
| General report on weak bridges along major roads | Olli Pyykönen | Jan. 1, 1998 - June 30, 2000 |
| Repair procurement procedures | Jouko Lämsä | Jan. 1 – Dec. 31, 1999 |
| Impact tests and improving of bridge safety barriers | Matti Kuusivaara | May 1, 1998 - Aug. 30, 2000 |
| Condition report of movable bridges | Seppo Aitta | 1999 - 2001 |
| **2. Improving the bridge procurement procedures** | | |
| Design instructions and Euro standards | Matti Kuusivaara | 1999 - 2001 |
| Construction guidelines | Mauno Peltokorpi | 1999 - 2000 |
| Improving the bridge procurement process | Mauno Peltokorpi | Jan.1-Dec. 31, 1999 |
| Quality-assurance procedures | Mauno Peltokorpi | 1999 |
| New materials and techniques | Mauno Peltokorpi | 1999 - 2001 |
| Tunnel structures | Olli Niskanen | 1999 - 2001 |
| Surface treatments of concrete structures | Ossi Räsänen | Jan.1, 1998 - Feb. 29, 2000 |
| Standard bridge structures | Matti Kuusivaara | 1999 - 2001 |
| Standard pretensioned bridge beams | Matti Kuusivaara | 1999 |
| **3. Environmental impact of bridges** | | |
| Life-cycle analysis | Seppo Aitta | 1999 - 2000 |

### Resources

Total expenditure on the research theme for 1999 will be FIM 3.4 million, of which external costs will account for FIM 2.8 million and Production FIM 0.6 million.

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# 18 DEVELOPMENT OF TRAFFIC AND ROAD RESEARCH INFORMATION SYSTEMS

## Background

Traffic and road information systems generate status data on the road network, traffic and the traffic environment to serve the needs of road and traffic planning, service procurement and traffic services. The following information systems are used at Finnra:

- road register
- bridge register
- condition register
- accident register

Traffic register (general traffic census, traffic monitoring system TMS and origin-destination surveys)

- weather system
- geographic information system

Over the following three-year period, the challenges include: new information requirements of the Road Administration division's core processes, e.g. concerning traffic flows, public transport, pedestrian and cycle traffic and roadside equipment and the structural condition of roads. Other key aims include improving the accessibility of register data through, for example, map-based interfaces and improving the reliability of the data on the condition of the road network and on traffic accidents.

## Aim

The aims for 1999 are:

- to complete the projects to improve road, bridge and condition registers
- automatization of the location of traffic accidents
- improving speed monitoring in the LAM system
- revision to the application that produces weather radar, satellite and road-weather camera images

## Content, resources and timetable

The contents of the research theme can be grouped by system. Since the systems are improved continuously, it is difficult to provide a timetable. At present, the improvement plans for most systems extend to the end of the year 2000.

| Theme/Sub-project | Coordinator |
|---|---|
| Improvement of the road register | Matti Raekallio |
| Improvement of the bridge register | Marja-Kaarina Söderqvist |
| Improvement of the condition register | Ismo Iso-Heiniemi |
| Improvement of the accident register | Auli Forsberg |
| Improvement of the traffic register | Pekka Räty |
| Improvement of the road weather register | Jouko Kantonen |
| Improvement of the geographic location register | Jarko Laine |

Total expenditure on the research theme in 1999 will be FIM 5.1 million, excluding commissions from Production. Total expenditure for the years 2000-2001 will be FIM 10 million.

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# 19 SYSTEMS FOR ROAD MANAGEMENT

## Background

Management systems are used in operational planning to draw up result targets and action programs for roads, bridges and gravel roads.

Finnra-level management systems include:

- **HIPS** (result target planning for paved roads)
- **TARVA** (analysis of impact on traffic safety)
- **VerkkoSiha** (result target planning for bridges)

And systems used in road regions include:

- **PMSPro** (planning of the paving program)
- **HankeSiha** (planning of action programmer for bridges)
- **TILSU** (analysis of OFP)
- **SoRaHa** (planning the need for preventive maintenance of gravel roads)
- Road markings management system

The immediate users of the systems are the road network information groups in road regions and in the central administration and the central administration's Strategic Planning and Traffic and Road Research units.

## Aim

In brief, the aims for 1999 are:

**PMSPro**: to be developed according to the planned timetable so that it can be introduced in May 1999. Following implementation the program will be supplemented as the need arises.

**HIPS**: need for improvements will be studied.

**Hanke-Siha**: the changes required by the new bridge register system will be made and condition forecasts and life-cycle analyses added.

**Monitored bridges**: inspections will take the proposals of the bridge monitoring analysis into account.

**Gravel roads**: systems for gathering data and analysis of maintenance measures will be improved.

**TARVA**: operating system will be renewed and usability enhanced.

**TILSU**: the "TM-target" and "TM-plan" will be converted for Access97 and the coding of measures renewed.

## Content

The projects and coordinators in 1999 are:

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Development of PMSPro | Reijo Prokkola | 1999 - 2000 |
| Development of HankeSiha | Marja-Kaarina Söderqvist | 1998 - 1999 |
| Development of HIPS | Pertti Virtala | 1999 - 2000 |
| Inspection and analysis of monitored bridges | Marja-Kaarina Söderqvist | Continuous |
| Data collection system for gravel roads and analysis | Ulf Lindström | 1998 - 2000 |
| Development of TARVA | Juhani Mänttäri | 1998 - 2000 |
| Development of TILSU | Jani Saarinen | 1998 - 2000 |
| RIMES project | Kari Hiltunen | 1998 - 1999 |

## Resources

The Road Administration division's own labor input will be 30 person work months /year, external funding FIM 2.85 million in 1999 and commissions from the Production division FIM 20,000. Consultation expenditure for the entire three-year period will be approximately FIM 10 million.

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# 20 TRAFFIC SAFETY STUDIES

## Background

The Traffic and Road Research unit is in charge of disseminating traffic safety information within Finnra. Reference data and background information for traffic safety work is acquired through traffic safety research. The research is conducted in line with the national resolution on traffic safety and Finnra's traffic safety strategy.

## Aim

The aim is to determine the effects of different types of action on traffic safety and on related data, and to utilize the data that has been gathered in drawing up guidelines.

## Content, resources and timetable

The sub-projects included in the table below are part of the traffic safety research theme. The available funds will not cover all of these reports. The resources available to partners and to Finnra will determine which sub-projects are given emphasis.

| Theme/Sub-project | Coordinator |
|---|---|
| Revision of speed limit guidelines | Juhani Mänttäri |
| Development of traffic safety map print-outs | Auli Forsberg |
| Safety impact of the reforms of traffic offence penalty | Seppo Sarjamo |
| Improving accident statistics | Forsberg, Sarjamo |
| Drawing up instructions for municipal traffic safety work | Seppo Sarjamo |

Total expenditure on the research theme for 1999 will be FIM 200,000. FIM 500,000 is proposed for both 2000 and 2001.

**Coordinator** of the research theme:
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# 21 TRAFFIC DEMAND

## Background

Traffic demand studies provide basic information on traffic, its background factors and causes. There are two studies being undertaken, one for passenger transport (National Passenger Traffic Survey) and one on goods transport (axle load study). The studies that are underway at present will bring the existing data up-to-date. In vehicle-kilometers studies a uniform method will be created to estimate the total vehicle mileage.

## Aim

In 1999 the following traffic-demand studies will be conducted:

- National Passenger Traffic Survey 1998-1999: compilation of research material, basic reports
- Axle-load study: compilation of research material, basic reports
- Vehicle mileage: harmonization of estimates made by various parties

**Content, resources and timetable**

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Passenger transport study 1998-1999 | Pekka Räty | 1998 - 1999 |
| Updating of the HELVI model | Pekka Räty | 2000 |
| Axle-load study 1998-1999 | Jouko Kangas | 1998 - 1999 |
| Special analysis of axle loads | Jouko Kangas | 2000 |
| Vehicle mileage studies | Pekka Räty | 1999 - 2001 |

Total expenditure on the research theme:

- 1999: FIM 1,500,000, 6.5 person-work months
- 2000: FIM 400,000
- 2001: FIM 200,000

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# 22 CONDITION REPORTING

## Background

The processing and interpretation of road condition information were the subject of considerable debate in 1998. Issues that were brought up included the way the condition of the road network is presented, the trend in the condition and the impact of available funds on the condition. In addition, the application of management by result to the management of road condition information was discussed, and a comparison with procedures and results of other countries was called for. As a theme, condition reporting was made into a separate R&D program in order to gain more research resources and to set more concrete result targets than would otherwise have been possible. Condition information can be divided into three categories, as follows:

- condition of paved roads
- condition of gravel roads
- condition of bridges

Matters pertaining to the condition of paved roads should be given initial emphasis. The condition reporting project carried out in 1998 led to several research projects on the management of road condition information, of which the most important are:

- presentation in popular form
- reliability (present status/target)
- trend in the condition and the impact of funding
- structural condition of roads
- international auditing pertaining to the use of condition information
- revision of condition variables (new service-level indicator and device for measuring damage)
- link between driving costs and conditions
- present condition/targeted condition/optimal condition

Condition information is used via management systems. The direct users of the information include road network information groups in road regions and the central administration units for Traffic and Road Research and strategic planning.

## Aim

In brief, the aims for 1999 are:

**Structural condition**: an indicator and models for it will be developed to measure the structural condition of asphalt concrete roads. A research program will be implemented to develop a structural condition variable for light pavement roads.

**Driving costs**: a literature study will be conducted on the relationship between driving costs and road conditions.

As the volume of research required by the research theme is considerably larger than allowed for in the 1999 budget, the aims for 1999 concern only two projects.

### Content

The projects for 1999 and their funding estimates (in FIM 1,000) are:

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Structural condition | Pertti Virtala | 1998 - 2000 |
| Driving costs | Pertti Virtala | 1999 |

### Resources

Finnra's labor input will be 2.5 person-work months, and FIM 350,000 is required in external funding.

**Coordinator** of the research theme:
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# 23 UUSIMAA REGION

## Background and aims

The Uusimaa road region's program does not include any extensive R&D projects. Instead, the region is to concentrate on carrying out its own investigations for the purposes of practical work. When the need arises, however, the region will contribute to the central administration's R&D projects by allowing its personnel resources to be utilized. The region's total expenditure on its own investigations will be approximately FIM 1 million in 1999. The Uusimaa region will undertake the following projects during 1999:

**The Poski project**: Compatibility of aggregates management and the protection and extraction of groundwater. The Geological Survey of Finland will complete the rock inventory in western Uusimaa that had been left unfinished and the related research and taking of samples. The Uusimaa Regional Environment Centre will investigate the groundwater status in the areas it views as most urgent, with the aid of bore holes, installation of groundwater observation pipes and by taking samples. The region's production division will perform the necessary terrain work.

The project is led by the Finnish Environment Institute, and participants include the Uusimaa Regional Environment Center, the Geological Survey of Finland, The Central Association of Earth-Moving Contractors in Finland, the Uusimaa road region and the Regional Council of Uusimaa.

**Coordinator**: Petter Sandin, tel. int. +358 (0)204 44 2788

## Bitumen emulsion dust binding

This method has been applied in Sweden and has also been tested on short sections of road in the Savo-Karelia and Häme road regions. The aim is to investigate whether the method is suitable for Uusimaa's gravel roads, for example in built-up areas when there is no possibility of surfacing in the near future.

**Coordinator**: Tapani Angervuori, tel. int. +358 (0)204 44 2705

## Noise barriers

The region will draw up a noise abatement program for public roads in the Helsinki metropolitan area together with the Helsinki Metropolitan Area Council (YTV).

At the same time, the costs of available noise barriers will be investigated and yet more economical solutions will be sought.

The actual impact of noise barriers already in place will also be investigated.

**Coordinator**: Elisa Sanasvuori, tel. int. +358 (0)204 44 2856

**Groundwater protection**

An investigation will be made into which groundwater protection methods can be used in different situations and into whether the costs incurred in road management as a result of groundwater protection measures can be reduced.

**Coordinator**: Arto Kärkkäinen, tel. int. +358 (0)204 44 2938

**Supplementary measures for projects already completed**

Supplementary surveys will have to be conducted at a number of previous test construction sites and projects in order to ensure the correct functioning of the structure, and reports will be prepared on these surveys. Minor supplementary measures will also be needed for further development of several projects. The projects affected are as follows:

- **KT51 Kirkkonummi test embankment follow-up survey and reporting**. The follow-up survey and final reporting on the test embankment are scheduled for completion in 1999.

- **Settlement calculation contest**; measurements of settlement, displacement and pore water pressure will be undertaken during 1999 at the Haarajoki grade-separated junction on main road no. 4.

- **Geo-reinforcement**; continuous measurement until 2000 on road no. 140 at Mikonkorpi in the town of Järvenpää and on local road 11737 at Hertsby bridge.

- **Development of deep stabilization**. Participation during 1999 in monitoring the deep-stabilized pier structures under test on local road 11689 at the Söderkulla - Nikkilä local road.

- **Utilizing recycled materials**. The project will study the use of recycled materials available to Finnra. So far, crushed tyres, crushed plastic and gypsum mould demolition waste (from the Arabia factories) have been investigated.

- **Site investigations register and frost measurement projects**. The projects are under way and the supplementary work will be completed in 2001.

**Coordinator** for the supplementary measures for completed projects is Petter Sandin, tel. int. +358 (0)204 44 2788.

# 24 TURKU REGION

## Background

The Turku road region has been engaged in actively improving the operation of its traffic management centers throughout the 1990s. The region's development work has also included various structural tests on clay ground with a low load-bearing capacity.

## Aim

The aim in 1999 is to conduct follow-up surveys for projects already in progress in conjunction with the other parties involved. A number of small-scale research projects concerned with maintenance and the operation of the traffic management centers will also be started during the year.

## Content, resources and timetable

The Turku road region's human resources will be allocated to the projects shown below and also, when necessary, to projects of the central administration. The project on the follow-up and effects of the Tunti pilot scheme forms part of the national research theme on road maintenance and its impact.

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Road no 272 Ämtöö-Poikeljärvi "Pori ash road" follow-up | Pekka Vahala | 1998 - 2001 |
| Main road no. 8 Raisio test embankment follow-up studies and survey report | Pekka Vahala | 1997 - 1999 |
| Silo local road no. 12657 repair of frost damage | Pekka Vahala | 1998 - 2001 |
| Impact of winter maintenance on main coastal roads | Reijo Hörkkö<br>Joint project with Central administration | 1998 - 2000 |
| Variable speed limits on 2-lane roads | Reijo Hörkkö | 1999 |
| Winter maintenance of pedestrian and cycle routes | Reijo Hörkkö | 1999 |
| Responsibilities of traffic management centers | Reijo Hörkkö | 1999 |
| Contracting out traffic management center weather reporting | Reijo Hörkkö<br>Joint project/ Central administration | 1999 - 2000 |

Turku region's total expenditure on R&D projects in 1999 will be FIM 496,000.

**Coordinator** for research theme

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# 25 SOUTHEAST FINLAND REGION

## Background

The research and development projects of the Southeast Finland Region are concerned with traffic management, improving the traffic safety of foreign drivers in Southeast Finland and coordination, support and development tasks at national level of Finnish National Road Administration (Finnra). The research on traffic management deals with road transport telematics and special aspects of traffic management. The research is intended to improve traffic management and to help in achieving the traffic safety and traffic flow objectives set for the Southeast Region.

## Aim

In 1999, the Southeast Region will continue it's traffic management-related research as part of Finnra's VIKING program, and will coordinate the VIKING program at a national level. The region will take part in national traffic management development projects and will study ways of improving the traffic safety of foreign drivers in Southeast. The Southeast Region will manage national R&D tasks concerning image-based monitoring of road and traffic conditions and the road weather information system.

## Content, resources and timetable

Southeast Region's R&D projects concerning traffic management and improving the traffic safety of foreign drivers in Finland are presented in the table below.

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Weather-controlled road | Yrjö Pilli-Sihvola | Dec. 1999 |
| Cross-border traffic management system | Petteri Portaankorva | March 2000 |
| Impact study of detection and warning system for large animals | Petteri Portaankorva | Nov. 1999 |
| Internet-based traffic information services | Kimmo Toivonen | Dec. 1999 |
| Image-based traffic monitoring | Yrjö Pilli-Sihvola | Dec. 1999 |
| Traffic flow controlled variable message signs | Petteri Portaankorva | March 2000 |
| Active road markings | Yrjö Pilli-Sihvola | June 2000 |
| Road signing for foreign drivers | Petteri Portaankorva | Oct. 1999 |
| Improving traffic safety of foreign drivers in Southeast Finland | Petteri Portaankorva | Dec. 2000 |
| Traffic management policy for weather-controlled road (E18 Turku - Vaalimaa) | Petteri Portaankorva | Oct. 1999 |
| Weighing in-motion | | xx 1999 |
| Road weather and traffic monitoring by probe vehicle | Jukka Savolainen | Dec. 2000 |

The national coordination, support and development tasks of the Southeast Road Region are presented in the table below.

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Development and support for road weather information system | Kimmo Toivonen | Until further notice |
| Development and support for image-based monitoring of road and traffic conditions | Jukka Savolainen | Until further notice |
| VIKING program coordination | Petteri Portaankorva | Until further notice |

The external costs of the research and development activities of the Southeast Region in 1999 will be approximately FIM 1,5 million and total expenditure for 1999 will be FIM 3,6 million.

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# 26 SAVO-KARELIA REGION

## Background

The European Union has granted FIM 2.5 million in funding for a project which searches for new uses for the gypsum and fly-ash created as industrial by-products. In addition to the Savo-Karelia road region, the other participants in the project are Kemira Chemicals, Kuopion Energia, Finnish Environment Institute, the municipality of Siilinjärvi, the Regional Council of Savo, and Viatek.

Direct feedback from research on service levels and from road users shows that road users feel that the level of winter maintenance of the lower-level road network is insufficient. A significant proportion of all the roads in the region fall within the lowest category of maintenance, category III. The maintenance classification does not take into account the special needs of road users across the lower-level road network, but instead considers the entire lower-level road network as one block.

## Aims

The aim of **the phosphogypsum project** is to find a new, environmentally safe use for gypsum and fly-ash from earthworks. Possibilities include repair of gravel roads, construction of noise walls, compaction and landscaping of refuse dumps, and different kinds of earthworks.

The aim of **the project for improving the quality of winter maintenance** is to improve the service provided to road users by improving the targeting and timing of maintenance measures on the lower-level road network. In particular, the aim is to improve the operating conditions for the business sector and for commercial and similar traffic movements (e.g. timber transport, school transport services). The purpose of the project is to re-examine some of the quality and time-keeping factors concerning customer needs on individual roads without changing the road's maintenance classification.

## Content, resources and timetable

| Project | Coordinator | Tel. | Project timetable |
|---|---|---|---|
| Using phosphogypsum in earthworks | Asko Pöyhönen | 5363 | Aug. 1, 1998 - July 31, 2001 |
| Quality of winter maintenance | Jukka Karjalainen | 5310 | April 4, 1998 - Oct. 31, 1999 |

Expenditure on the phosphgypsum project in 1999 will be FIM 400,000 and in the years 2000-2001, FIM 400,000 (funding from the EU is not included in these figures). Test construction will be carried out in 1999, these test structures will be monitored in 2000 and 2001, and an instruction will be drafted after the project is completed.

The winter maintenance quality project will be implemented separately. Regional construction projects that have begun during the project have paid more attention to the quality of winter maintenance. The experiences gained will be analysed and the results used for example in revising the quality requirements of regional construction projects.

**Coordinators**: Jukka Karjalainen, Asko Pöyhönen
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# 27 VAASA REGION

## Background

The aim of Vaasa road region's research and development work is to establish the properties and behavior of different materials in the road structure. In addition, the programs include trials with various methods for determining the condition and structure of roads and for supporting quality improvement. The region also contributes to Finnra's central R&D work.

## Aim

The aim in 1999 is, in particular, to determine the uses for ground penetrating radar in different situations and to research suitable materials for a carefully defined set of purposes.

## Content, resources and timetable

The region's R&D program contains 12 sub-projects. Some of these are the region's own projects, while others are joint projects with another region or national projects. Each project has its own coordinator.

| Theme/Sub-project | Coordinator | Project timetable |
|---|---|---|
| Murro test embankment, settlement monitoring, Seinäjoki | Mauri Kimpimäki | 1993 - 2000 |
| Use of ash in the road structure | Urmas Alho | 1996 - 2000 |
| Kokkola mini test road, precision study of preventive maintenance measures | Arvo Lähde | 1998 - 2000 |
| Investigation of the Resilient/Suction characteristics in materials of the base course | Arvo Lähde | 1998 - ??? |
| RPPGH, participation | Arvo Lähde | |
| Sawdust road, investigating uses in the road structure | Arvo Lähde | 1998 - ??? |
| Isojoki test road, change in form of steel meshing in a stabilized structure | Arvo Lähde | 1997 - ??? |
| Quality of base course, report | Arvo Lähde | 1998 - ??? |
| Thickness and cross-sections, investigating the uses for ground penetrating radar | Arvo Lähde | 1999 - 2000 |
| Condition survey of gravel roads using ground penetrating radar | Arvo Lähde | 1999 - 2000 |
| Developing a weather index | Raimo Sillanpää | 1999 |
| Improving quality monitoring of winter maintenance | Raimo Sillanpää | 1999 |

Total expenditure on the research theme in 1999 will be FIM 710,000.

**Coordinator** for the research theme:
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# 28 LAPLAND REGION

## Background

The Lapland road region's R&D operation in 1999 will consist principally of small-scale trials and studies. The follow-up studies for the RPPGH test schemes are continuing with terrain surveys. All projects are already under way and will be completed during 1999. No new projects are to be started.

## Aims

To develop environmentally friendly and durable materials, and to introduce new methods and working practices.

## Projects

Follow-up studies for the RPPGH test schemes at the following sites: road no. 941 at Männikkövaara, road no. 83 at Pello and road no. 78 at Ranua. The studies include frost leveling, load-bearing measurements and analysis of damage at the study sites.

**Contact**: Ulla Juujärvi/Financial Planning

Kemi test structures, productization of Outokumpu chromium mine waste. The waste rock from the Esijärvi mine being studied has been used to make bound and unbound test structures. Participation in project and steering groups.

**Coordinator**: Ulla Juujärvi/Financial Planning

Recording of measurement and survey data in the GIS (XROAD and MAP) database.

All the measurement and survey data (aerial photographs, digital terrain models, base maps, bench marks and control networks) of the Lapland road region will be stored on computer using the basic map register (in the XROAD and MAP databases).

**Coordinator**: Timo Kenttälä/Procurement of Works and Services

Interdependence of the resilient-module and suction properties, further research.

## Coordinator

Timo Kenttälä/Procurement of Works and Services

## Resources

Funding required for the projects is approximately FIM 0.342 million.

# 29 PRODUCTION: IMPROVEMENT OF WINTER MAINTENANCE

## Background

This development project is a continuation of the Production division's current development theme Environmentally friendly anticipatory winter maintenance. The project work is based on Finnra's traditional expertise, the demands of efficiency and the environment, and taking into account the objectives of the Road Administration and Production divisions.

## Aim

The aim of the project is to develop a control system for winter maintenance with reference to the traffic management system and modern technology so that the road conditions can be maintained by anticipatory actions and that work teams can be effectively provided with support in deciding on working methods and the timing of work undertaken. The improvement of reporting systems for winter maintenance and methods which are environmentally friendly are important aims.

## Content, resources and timetable

The content of the research theme is outlined in the project names given below. They are all long-term projects and are subdivided for practical purposes into sub-projects on the basis of time, aims and costs.

| Projects | Coordinator | Project timetable |
|---|---|---|
| **Traffic management center**: role and expertise of operators | Rauno Kuusela (Juhani Martimo) | 1988- |
| **Anti-skid treatment**: following research undertaken in other countries (e.g. on materials), Finnra's own tests | Rauno Kuusela | 1988- |
| **Quality management and reporting**: measurement of pavement condition, indication of salt quantity, timing of measures, information systems for reporting | Rauno Kuusela | 1988- |
| **Other winter maintenance techniques**: control system for main equipment ('Lukkari' interface) | Rauno Kuusela | 1988- |
| **Winter maintenance resources** Modeling of overall winter maintenance demands | Rauno Kuusela | 1999- |

Total expenditure on the research theme in 1999 will be FIM 3,500,000, and for the years 2000-2001, FIM 3,500,000 per year.

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# 30 PRODUCTION: GRAVEL ROADS

## Background

The project is a continuation of the development work under the heading Contract work for managing gravel roads, which is already in progress. The management and maintenance of gravel roads has been seen as an important technical and a contract management issue. The project will secure the continuation of technical development work in Finnra's new circumstances and the improvement of contract management, from the viewpoint of both the Road Administration and Production divisions.

## Aim

The aim of the project is to develop, in conjunction with the Road Administration division, a set of measurement instruments and related product requirements needed in contract work on gravel roads. The project includes use of the measuring instruments in contract management and the development of measurement techniques. A further key research area deals with maintenance materials and methods.

## Content, resources and timetable

The content of the research theme is outlined in the project names given below. They are all long-term projects and are subdivided for practical purposes into sub-projects on the basis of time, aims and costs.

| Projects | Coordinator | Project timetable |
|---|---|---|
| **Maintenance contract management (condition, detrimental effects on driving and environment)** measuring instruments, levels and tests, new research and measuring technology, frost damage | Heikki Vesa | Start June 1998<br>Completion 2001 |
| **Quality assurance, reports**: quality measurement and reporting systems | Heikki Vesa | Start Jan. 1999<br>Completion 2001 |
| **Wearing course materials and production methods**: natural materials and waste or recycled materials | Heikki Vesa | Start June 1998 (earlier stage 1995). Continuous process. |
| **Contract period**: effect on road management, production technology, risks and finances. | Kai Rantapere | Start July 1998<br>Completion 2000 |

Total expenditure on the theme in 1999 will be FIM 2,800,000, and in the years 2000-2001, approximately FIM 2,900,000 per year.

**Coordinator** for research theme
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# 31 PRODUCTION: ROAD STRUCTURE

## Background

The project is a continuation of the development work already under way, entitled Structures for optimal condition. Repair of the road structure in particular is a key area of expertise within Finnra. Under difficult funding conditions, the importance of effective technical solutions is highlighted.

## Aim

The aim of the project is to develop repair techniques for the road structure and the overall management of repairs, to produce cost-effective structural options which are efficient in terms of their cost/quality ratio, and to develop the know-how for their effective use. Productization work and the related testing will be carried out in association with the Road Administration division. Development of the technical research and dimensioning methods and of the effective use of new sources of materials are also aims of the project.

## Content, resources and timetable

The content of the research theme is outlined in the project names given below. They are all long-term projects and are subdivided for practical purposes into sub-projects on the basis of time, aims and costs.

| Projects | Coordinator | Project timetable |
|---|---|---|
| **Utilizing by-products**: industrial by-products for use in road structure | Heikki Suni | 1992 - 2001 |
| **Promoting adoption of methods, e.g.**: crushed stone spreading technique, heat-insulated drums, steel meshing in the road structure, stabilization technology, deep drainage | Heikki Suni | 1999<br>1996 - 2000<br>1999 - 2000<br>1999 - 2001<br>1998 - 2000 |
| **New production technology**: boulder clay pelletizing technology<br>ceramic road structure | Heikki Suni | 1996 - 2000<br>1997 - |
| **Structural improvement methods**: development of new, cost-effective methods. | Heikki Suni | 1999 |

Total expenditure on the research theme in 1999 will be FIM 3,500,000, and in the years 2000-2001, FIM 3,500,000 per year.

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# 32 PRODUCTION: CONTRACTING

## Background

The project is a continuation of the development work already under way, entitled turn-key contracts as a routine. The areas of road management service procurement and contracting have been under development for several years already, with the aim of being ready to procure productive work under free competition and of preparing the Production division to become a State enterprise.

## Aim

The aim of the project is to further the development of a 'contracting culture' in the road management sector in a way which stresses the responsibility of the contractor. The motive is to improve the competitiveness of production contracting based on the needs of road management. Key aspects are the analysis of experience gained from turn-key contracts and disseminating the lessons from this to organizations that require this information, the development of key products, ensuring the creation of the know-how needed to develop such products, and development of the elements of contract management.

## Content, resources and timetable

The content of the research theme is outlined in the project names given below. They are all long-term projects and are subdivided for practical purposes into sub-projects on the basis of time, aims and costs.

| Projects | Coordinator | Project timetable |
|---|---|---|
| **Key products**: content of turn-key products, know-how concerning products and deliveries | Erkki Nevala | 1988 - |
| **Instructions, guidelines**: comprehensive road management operating model | Erkki Nevala | 1988 -1999 |
| **Testing**: testing the operating model, piloting in practical work | Erkki Nevala | 1988 - |
| **Information systems**: information systems that support development of operations | Erkki Nevala | 1999 - |

Total expenditure on the research theme in 1999 will be FIM 2,700,000, and in the years 2000-2001, approximately FIM 2,700,000 per year.

**Coordinator** for the research theme:
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# 33 PRODUCTION: CONSULTING SERVICES

## Background

The new business culture of road management requires that new kinds of operating models and know-how are adopted in consultancy activities. Development work and preparation have been in progress for some years already. The project is a continuation of the development project under way this year, entitled Effective consultancy services.

## Aim

The aim of the project is to develop the working practices in consultancy, the compatibility of flexible work phases, and product entities so that the Road Administration division and contracting work can be provided with a considerably improved service. The aim is also to develop the ability of consultancy to offer services to new client groups and to facilitate competitiveness in different areas of production.

## Content, resources and timetable

The content of the research theme is outlined in the project names given below. They are all long-term projects and are subdivided for practical purposes into sub-projects on the basis of time, aims and costs.

| Projects | Coordinator | Project timetable |
|---|---|---|
| **Research, key expertise**: development of key expertise, promoting the utilization of research results | Seppo Salmenkaita | continuous |
| **Consultancy products**: new products (e.g. road analysis) products for new clients | Seppo Salmenkaita | 1998 - 2001 |
| **New technology**: utilizing new technology (e.g. ground penetrating radar, frost probe, GIS) | Seppo Salmenkaita | Continuous |
| **Contract services**: development of internal operating methods for production (e.g. EasyWay) | Seppo Salmenkaita<br>Esko Koivu | 1998 - 2001 |

Total expenditure on the research theme in 1999 will be FIM 3,500,000 and in the years 2000-2001, FIM 3,500,000 per year.

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# 34 PAVING METHODS

## Background

Road paving forms an own technical, which in the Production has been organized as own division at national level. Two research projects concerning pavement production technology and quality control have been started in the current year. The intention is to continue the development work and also broaden it to include road marking technology.

## Aim

The aim of this program is to develop pavement production and road marking technologies, procedures and materials. A further aim is to develop and more precisely define the planning techniques and design standards for maintenance work, and also to define the division of labor related to these.

## Content, resources and timetable

The content of this research programme is outlined in the project names given below. They are all long-term projects and are subdivided for practical research work into sub-projects on the basis of time, aims and costs.

| Projects | Coordinator | Project timetable |
|---|---|---|
| **Mass production**: emulsion and heating techniques, soft asphalts, industrial by-products, environmental health | Jorma Paananen | Sept. 1998 - |
| **Production technology**: methods, transportation techniques, quality control, control and management system for pavement products and production | Jorma Paananen | Jan. 1999 - |
| **Contract management**: design technologies, standard of design and division of labor, management of turn-key projects | Jorma Paananen | Jan. 1999 - |
| **Road markings**: functional properties, retroreflexion, water-soluble materials, drying times, thermoplastic and light thermoplastic | Jorma Paananen | May 1999 - Oct. 1999 |
| **Stabilization**: developing technology for by-products, treatment technologies for wearing course of gravel roads | Jorma Paananen | May 1999 - |

Total expenditure on the research programme in 1999 will be FIM 2,000,000, and in the years 2000-2001, FIM 2,000,000 per year.

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# 35 PRODUCTION: OTHER TECHNOLOGIES

## Background

The project covers development of production technology for contracting and consultancy which is not appropriate for inclusion in other main projects. This may include testing of the applicability of new technical solutions and tools appearing on the market, and further development and testing of ideas generated by improvement proposals and initiatives.

## Aim

The aim is to maintain a continual and active process of ideas formulation within the Production division and to bring the ideas thus generated into use.

## Content, resources and timetable

The content of the research theme is outlined in the project names given below. They are all long-term projects and are subdivided for practical purposes into sub-projects on the basis of time, aims and costs.

| Projects | Coordinator | Project timetable |
|---|---|---|
| **Equipment and methods**: development of initiatives, testing and disseminating information | Erkki Nevala | 1999 - |
| Continuous improvement: support for continuous improvement of operations | Tapani Koljonen | 1999 - |
| **Markets**: monitoring and investigation work linked to development activities | Kai Rantapere | 1999 |

Total expenditure on the research theme in 1999 will be FIM 1,500,000, and in the years 2000-2001, FIM 1,500,000 per year.

**Coordinator** for the research theme
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# 36 PRODUCTION: OPERATING SYSTEMS

## Background

The operating systems for the Production division's functions have been actively developed since 1997. The systems meet the traditional quality requirements and also take account of environmental and work safety issues. In developing the systems, emphasis has been given to adopting tools used for continuous improvement: audits, customer feedback, improvement proposals and inventions, self-evaluations and management reviews.

## Aim

Acceptance auditing for the Road Administration division will be applied in 1999 for its contracting, consulting and ferry operating systems. External RAKLI-SKOL-ATL approval will also be sought for consultancy in 1999, and external RAKLI-SML-RTK-KL-ASLI approval for contracting in 2000. The aim is also that the tools for continuous development will be used in each unit/team.

## Content, resources and timetable

The content of the research theme is outlined in the project names given below. They are all long-term projects and are subdivided for practical purposes into sub-projects on the basis of time, aims and costs.

| Projects | Coordinator | Project timetable |
|---|---|---|
| Operating system for contracting | Harri Saarinen | 1998 - 2000 |
| Operating system for consultancy | Teija Snicker-Järvinen | 1998 - 1999 |
| Operating system for ferries | Jussi Rahila | 1998 - 1999 |
| Improvement proposals and inventions | Anneli Toivonen | 1998 - 2000 |
| Operating system intranet | Tapani Koljonen | 1999 |

Total expenditure on the research theme in 1999 will be FIM 900,000, and in the year 2000, FIM 600,000.

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# COORDINATORS OF STRATEGIC PROJECTS/THEMES 1999

| STRATEGIC PROJECT/THEME | COORDINATOR | TEL. |
|---|---|---|
| S Road structure research program (S4) | Aarno Valkeisenmäki | 2140 |
| S Solutions to improve main two-lane highways | Pauli Velhonoja | 2315 |
| **STRATEGIC PLANNING** | | |
| T Traffic safety | Saara Toivonen/ | 2039 |
| | Mirja Peljo | 2023 |
| T Operability of the transport system | Ulla Priha | 2057 |
| **TRAFFIC SERVICES** | | |
| T Traffic management | Mirja Noukka | 2027 |
| T Customer service | Jukka Hopeavuori | 2412 |
| T Traffic control | Kullervo Havu | 2468 |
| **PROCUREMENT OF WORKS AND SERVICES** | | |
| T Developing procurement | Ari Huomo | 2670 |
| **TRAFFIC AND ROAD ENGINEERING** | | |
| T Impact evaluation | Reima Petäjäjärvi | 2175 |
| T Traffic engineering | Pauli Velhonoja | 2315 |
| T Environment | Anders Jansson | 2348 |
| T Maintenance and its impact | Anne Leppänen | 2411 |
| T Structures and equipment | Kari Lehtonen | 2317 |
| T Pavements | Kari Lehtonen | 2317 |
| T Geotechnical structure | Pentti Salo | 2145 |
| **BRIDGE ENGINEERING** | | |
| T Bridges | Matti Kuusivaara | 2349 |
| **TRAFFIC AND ROAD RESEARCH** | | |
| T Traffic and road research information systems | Kari Hiltunen | 2530 |
| T Management systems for road management | Pertti Virtala | 2581 |
| T Traffic safety studies | Auli Forsberg | 2534 |
| T Traffic demand | Pekka Räty | 2601 |
| T Road network condition surveys | Pertti Virtala | 2581 |
| Production R&D | Erkki Nevala | 2904 |
| **ROAD REGION CONTACTS** | | |
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| Lapland | Ulla Juujärvi | |

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